

**Introduction to Transportation Systems**

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**Fall 2006**

**LECTURE 13 (and forward):**  
**TRAVELER TRANSPORTATION**

**DISPLAYS**

**SPEAKER: Joseph M. Sussman**  
**MIT**

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# Traveler Transportation Outline

- ◆ Transportation and Communications
- ◆ Why People Like Cars
- ◆ Contrasting Urban and Intercity Transportation
- ◆ Intercity Traveler Transportation
  - ◆ Air Transportation
  - ◆ Rail Transportation

# Substitutability of Communications and Transportation

- ◆ Two opposing perspectives:
  - ◆ Communications will greatly reduce the need for transportation because of the telecommuting option; people will not have to actually physically be at the office to make a contribution.
  - ◆ On the other hand, while telecommuting may occur, the economic interactions that will occur as a result of enhanced communication may generate *more* travel than is saved by the telecommuting option.

# Why People Like Cars

- ◆ We like the flexibility
- ◆ The automobile network is universal
- ◆ It often (but not always) is the fastest mode, depending on levels of congestion, time of day and the available alternatives
- ◆ Privacy
- ◆ Automobiles suggest that you are at a higher level of society
- ◆ People simply enjoy the sensation of driving

# Land Use Patterns

- ◆ Given the way our land-use patterns have developed, particularly in the United States, cars are virtually a necessity. There are areas where taking at least part of your trip without an automobile is virtually impossible.
- ◆ Land-use densities are so low that public transportation is not viable. The automobile is fundamental and a necessity of life, not a luxury, depending upon land-use choices that society makes.

# A Final Set of Reasons We Love Cars

- ◆ It is very often a good transportation buy. It is a good value for your transportation dollar.
- ◆ You get this high-quality transportation service which is a good buy, because *somebody else* is paying a lot of the costs for the infrastructure and cleaning up the environment.
- ◆ This choice is economically rational. Highway transportation may well be cheap, or at least cheap relative to the level-of-service that is being provided to you, because of the way in which the costs of the highway infrastructure are paid for.

# Urban contrasted with Intercity Traveler Transportation

Class Discussion

**INTERCITY TRAVELER  
TRANSPORTATION:  
AIR**

# Reasons for Air Industry Financial Problems

- ◆ *Competition* is the critical element. There are those that would argue that the industry has more capacity than it needs for the demands it serves.
- ◆ Earnings in the airline industry are very sensitive to the ratio of filled seats to total seats. Once a seat flies empty, the revenue from that seat is gone forever. And airlines, recognizing that fact, have gone through some *destructive pricing battles*.
- ◆ The airline industry finds it difficult to quickly adjust its fleet size and hence its capacity. The time between ordering new aircraft from the manufacturer and delivery to the airline can be several years.

# Traveler Transportation: Air Industry

Trends: Strategic Alliances

Low-cost Airlines (for example, Southwest)

Discussion: The Logan/ Green (RI)/ Manchester (NH) Airport System

Discussion: The Boeing-Airbus Competition

# Air Traveler Transportation and the 30 “Key Points”

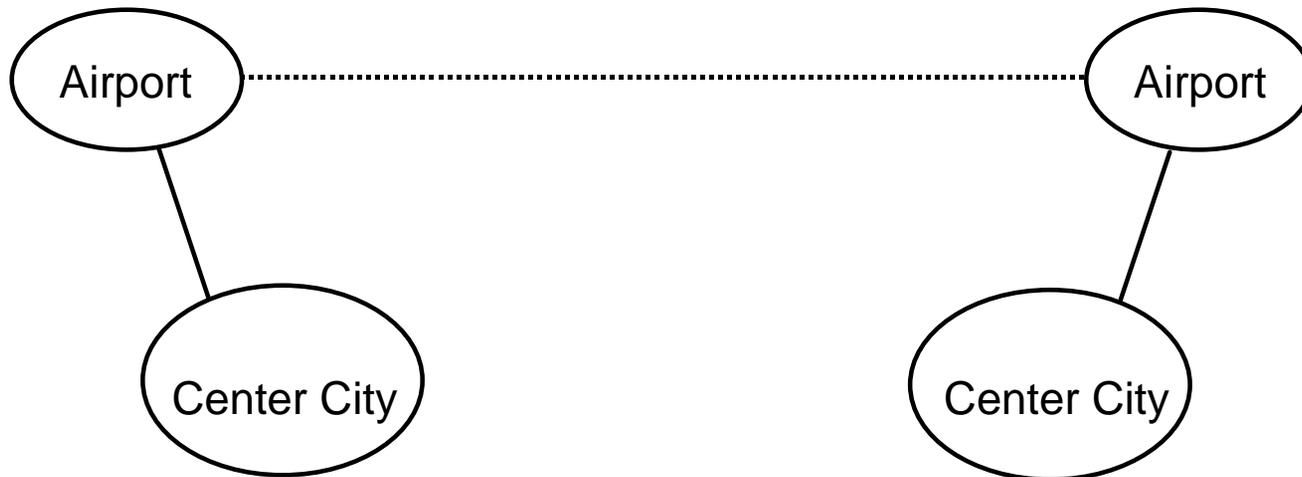
- ◆ Stochasticity
- ◆ Peaking in Demand
- ◆ Selecting Capacity
- ◆ Network Behavior

Other Key Points?

# Land-Side Issues

## ◆ Airport Access

### Airport Location



It is door-to-door travel time that matters.

Figure 29.1

# Aircraft Technology

- ◆ Aircraft Size
- ◆ Short Take-Off and Landing Aircraft
- ◆ Hypersonic Flight
- ◆ The “Space Plane”
- ◆ Engine and Materials Technology
- ◆ Blended Wing Body

# Air Transportation as an Example of Subsidies

- ◆ Subsidies
  - ◆ Between long-distance and short-distance passengers. Cost functions look different for long-distance and short-distance passengers, so there may be cross-subsidies.
  - ◆ Between business and non-business travelers. Business travelers require flexibility to make plans on very short notice and change their plans very quickly. The airline industry charges them a premium for this service.
  - ◆ Among various origin-destination pairs. Customers on the non-competitive routes subsidize those on competitive routes.

# Flows of Funds in Air Transportation

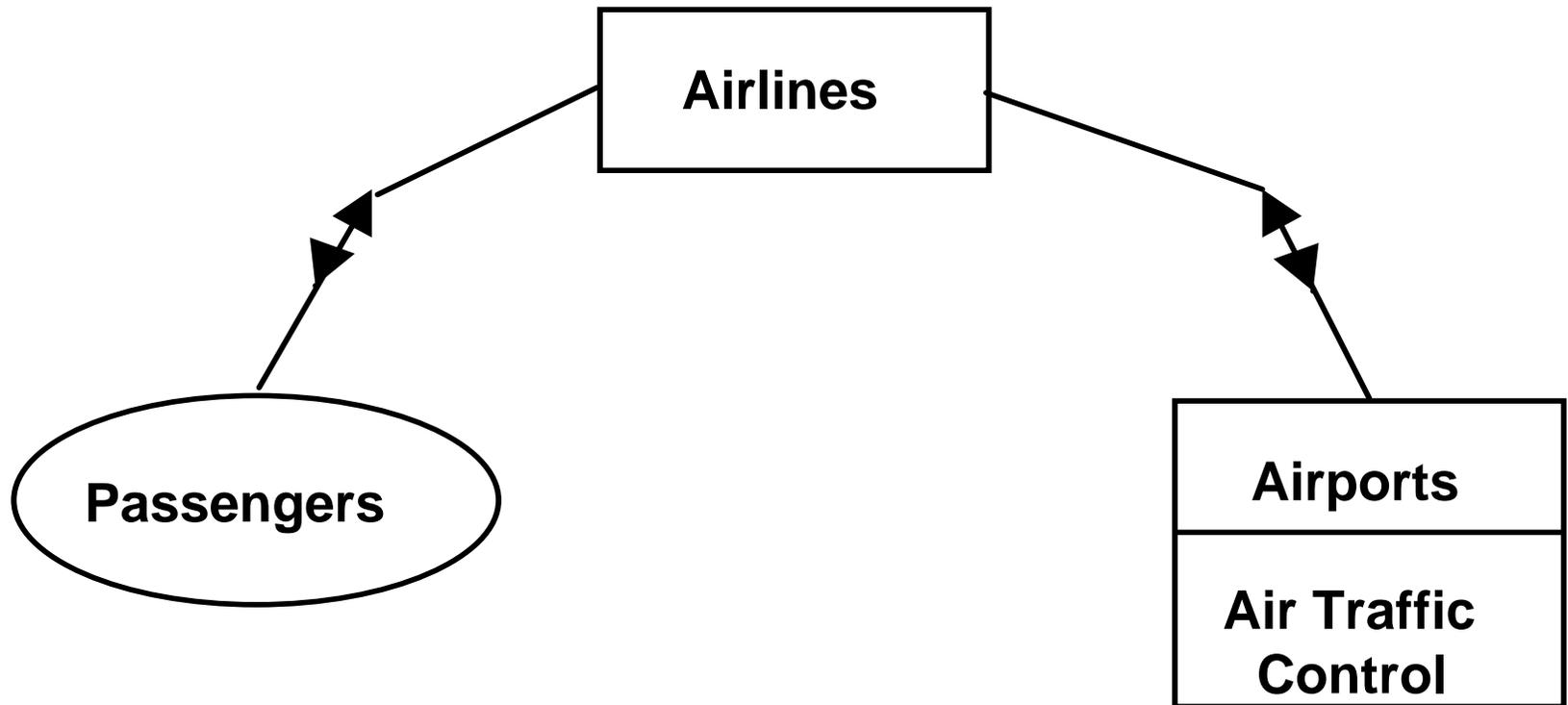


Figure 29.4

# Subsidies in Air Transportation

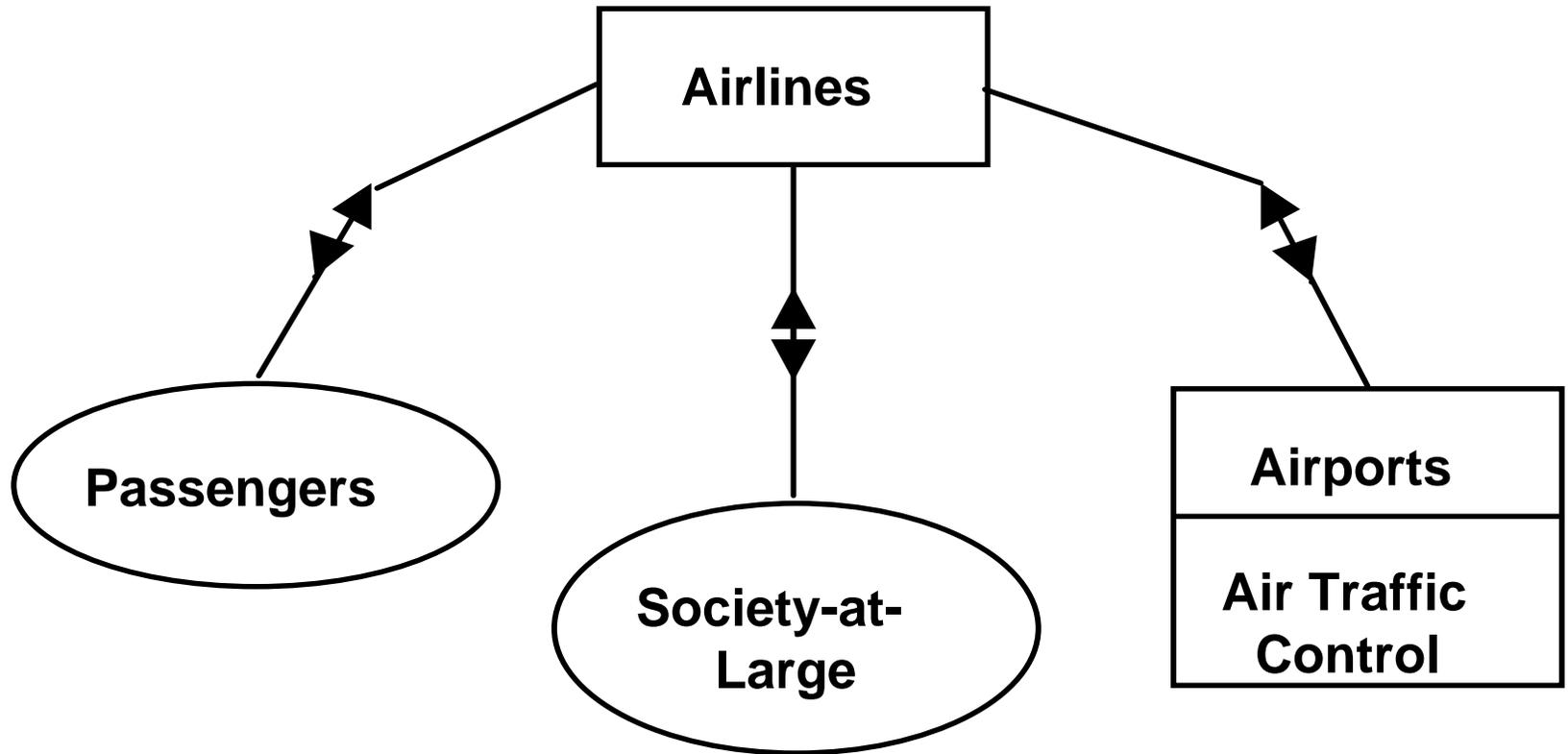


Figure 29.5

- ◆ Does Society-at-Large Benefit Enough to Warrant the Subsidy to Air Transportation?

## CLASS DISCUSSION

# INTERCITY RAIL TRANSPORTATION

A key question: Why do nations in the developed world have such different approaches to traveler intercity rail?

For example--TGV in France and Shinkansen in Japan vs US

***Discussion***

# Technology for High-Speed Rail

- ◆ The technologies for high-speed rail used in Japan, France and Germany all require a dedicated right-of-way (no other passenger or freight rail service)
- ◆ Track structures are typically continuous welded rail and concrete ties
- ◆ Due to design speeds, there are horizontal and vertical curve constraints that are much more stringent than for conventional trains
- ◆ For power, electrification is standard
- ◆ Rolling stock for high-speed rail uses low-weight equipment, since energy costs are proportional to the weight of the car and to the cube of the speed
- ◆ Noise becomes more of an issue with high-speed trains. For example, the noise of the pantograph on the top of the cars picking up electric power from power lines is quite substantial at high speeds

# Rail Characteristics

- ◆ Surface Mode on Rail Guideway
  - ◆ Energy
  - ◆ Control
  - ◆ Speed
  - ◆ Noise

CLASS DISCUSSION

# International Systems

- ◆ The TGV in France routinely provides service approaching 200 miles an hour.
- ◆ Shinkansen operations provide service in the range of 170 miles an hour throughout Japan and have operated since 1964
- ◆ High-speed rail technologies in Germany (the ICE Train), Sweden (Tilt Trains) and Italy are also deployed.
- ◆ These countries have all made a strong commitment to high-speed rail as a viable alternative for domestic air or highway for intercity travel.

# RAIL STATION VS. AIRPORT LOCATION

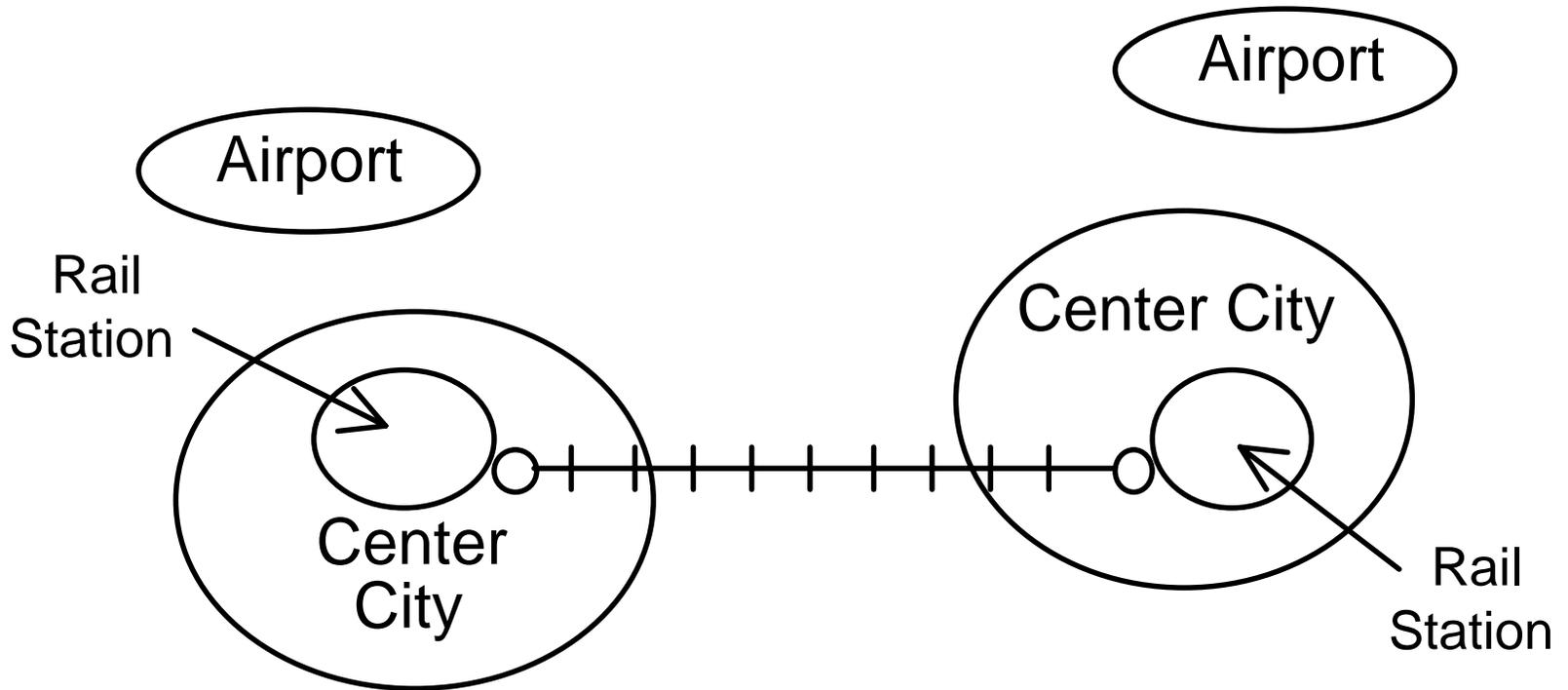


Figure 30.1

# MAINTENANCE COST VS. SPEED

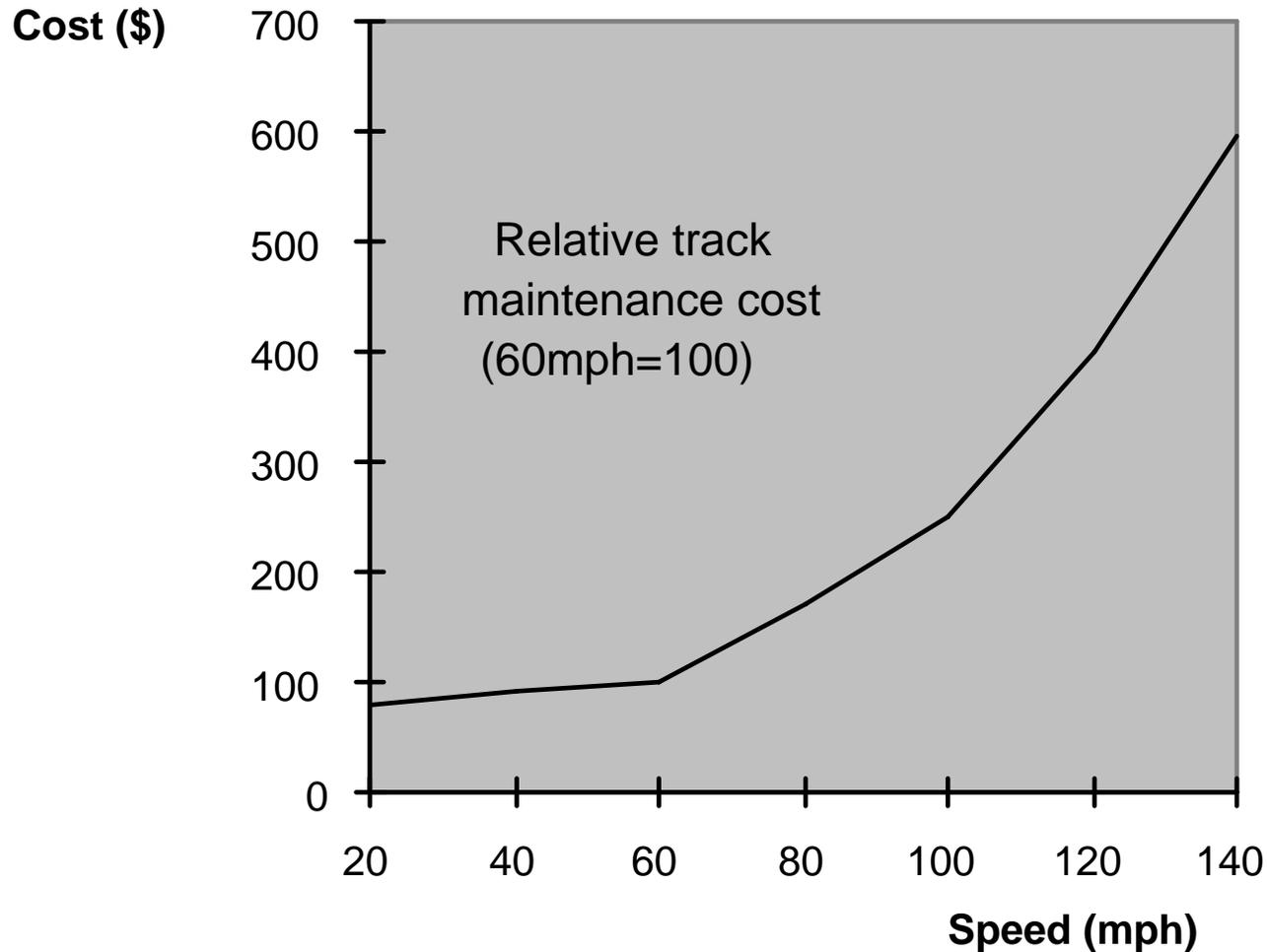
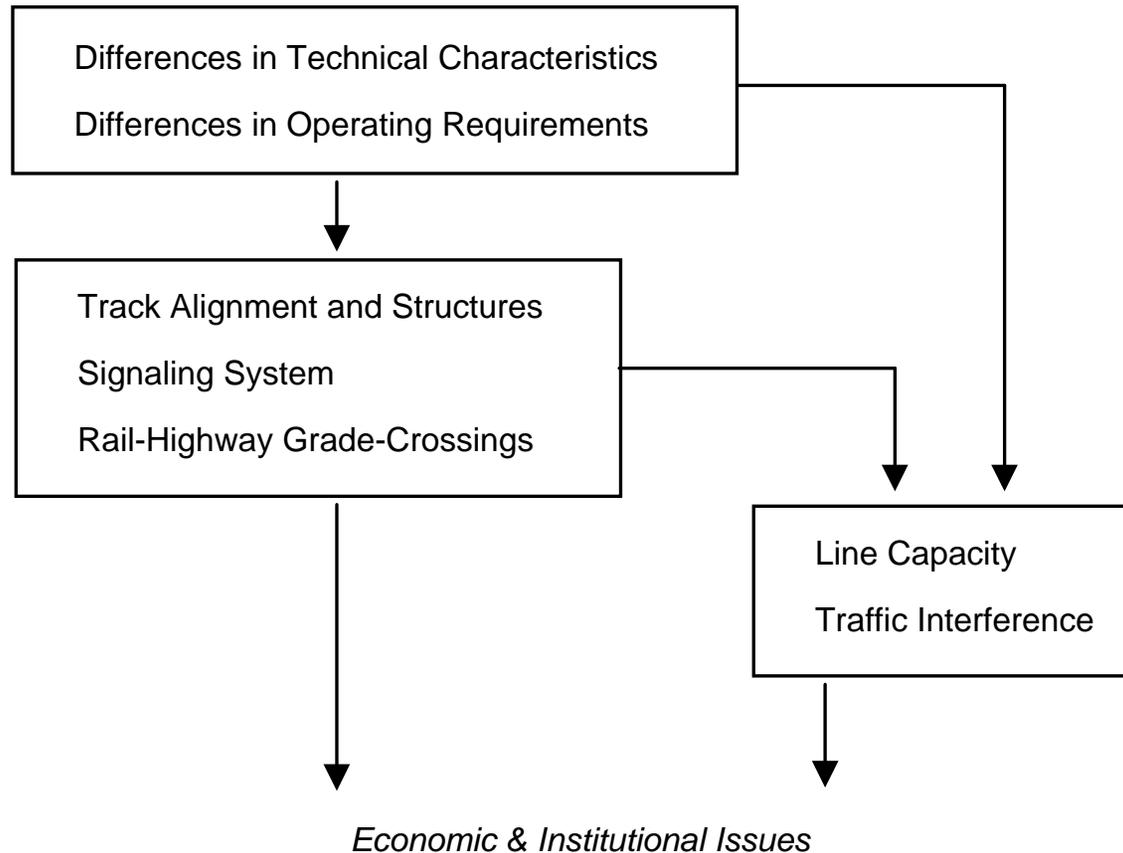


Figure 30.3

# SHARING R.O.W. BETWEEN PASSENGER AND FREIGHT TRAINS



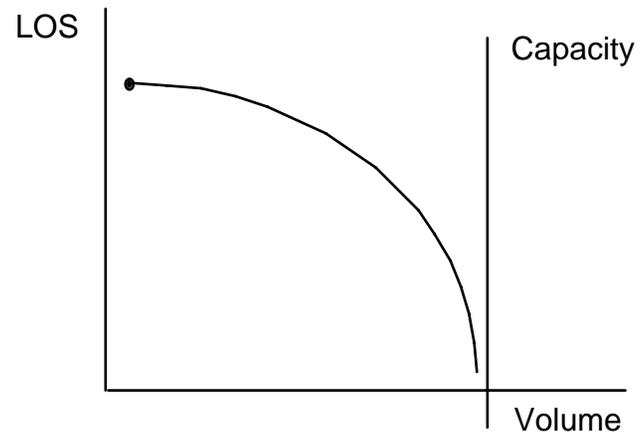
Source: Roth, Daniel, "Incremental High Speed Rail in the U.S.: Economic and Institutional Issues", Thesis for Master of Science in Transportation, Department of Civil and Environmental Engineering, MIT, July 1994.

Figure 30.5

# PERSPECTIVES OF FREIGHT RAILROADS ON PASSENGER SERVICE

## ◆ Capacity

**LOS Degrades as Volume Approaches Capacity**



## ◆ Liability

- ◆ The risk profile changes when a railroad has passenger operations, because of the increased probability of injuries and deaths.

## ◆ Cost-Sharing and Cost-Allocation

- ◆ Right-of-way is being shared by freight and passenger; how do you decide who pays what for the use of that right-of-way?

# HSR, INCREMENTAL HSR AND MAG-LEV

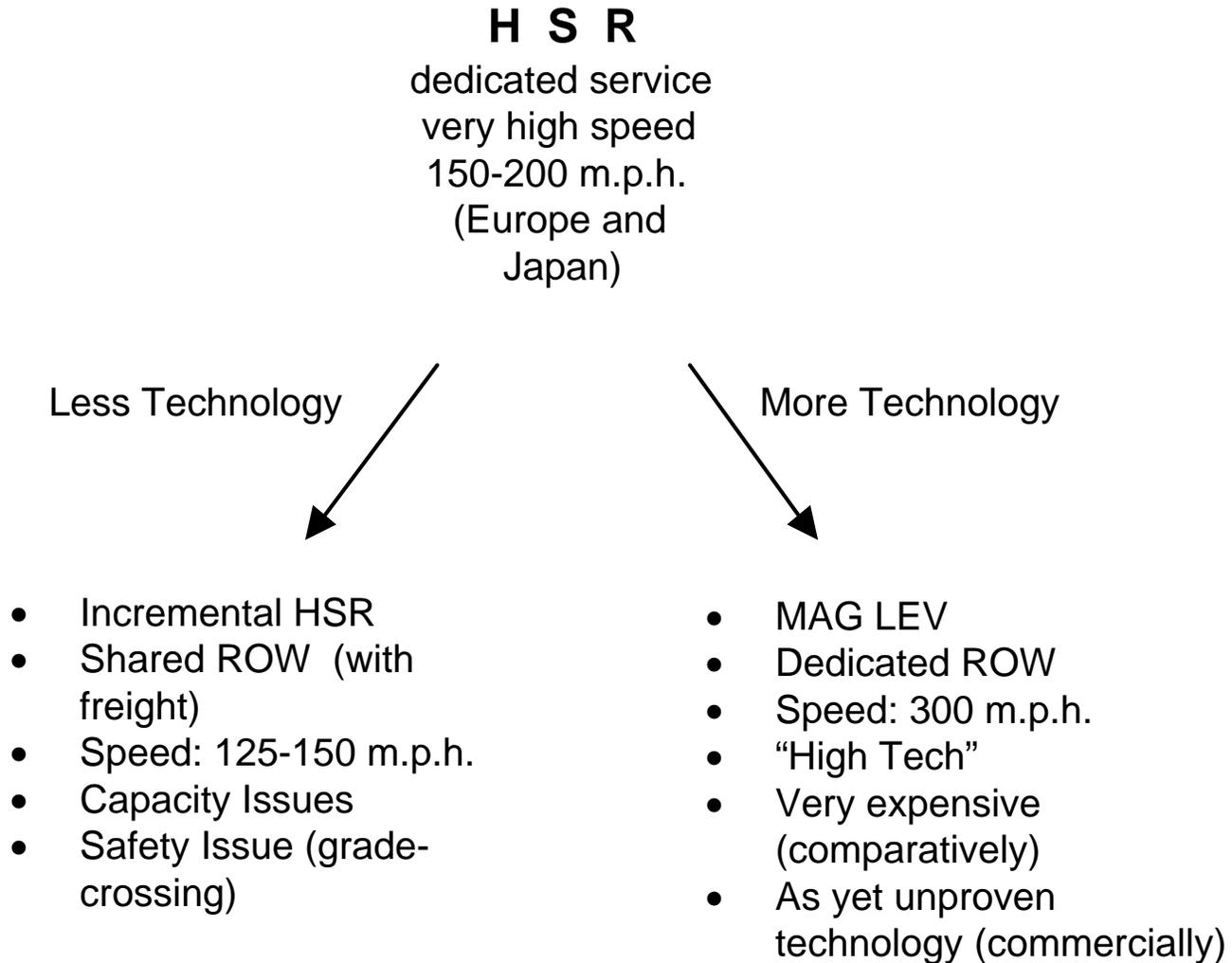


Figure 30.7

# SOME AMTRAK BUSINESS MODELS FOR INTERCITY TRAVELER RAIL IN THE U.S.

- ◆ Ownership
  - ◆ Infrastructure Company
  - ◆ Operating Companies
- ◆ Rail/Air Intermodal
- ◆ Regionally-Scaled Systems

# SOME AMTRAK-RELATED PUBLIC POLICY ISSUES

- ◆ Environment
- ◆ Congestion
- ◆ Urban Form
- ◆ Who benefits and who pays
  - ◆ TRUST FUND
- ◆ Modal Diversity
- ◆ Equity

# KEY INTERRELATIONSHIPS

